

DOCUMENT RESUME

ED 380 774

CS 012 071

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TITLE A Study of the Relationship between Birth Order and Reading Achievement among Seventh and Eighth Graders.
PUB DATE 92
NOTE 28p.
PUB TYPE Reports - Research/Technical (143)
EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Analysis of Variance; *Birth Order; Grade 7; Grade 8; Junior High Schools; Junior High School Students; *Reading Achievement; Reading Research; *Sex Differences
IDENTIFIERS Last Born; Philadelphia School District PA

ABSTRACT

A study examined the underlying relationships between birth order and reading achievement. Subjects were 269 students attending a suburban Philadelphia, Pennsylvania, senior high school who took the Metropolitan Achievement Test (MAT) in the spring of their seventh- and eighth-grade years. One way, two way, and multiple analyses of variance were used. Results using the scaled scores on the MAT indicated that: (1) first-born children performed significantly better than those not first-born; (2) first-born females performed significantly better than males who were not first-born; and (3) first-born in two-children families performed significantly better than last born of families of more than two children. However, there was a discrepancy between scaled and raw scores--scaled scores appeared to inflate the raw scores by making differences appear larger in number. Findings suggest that there is as yet no need to group children by birth order because there was no significant difference in the reading achievement of children of different birth orders when raw scores were used. (Contains 47 references and nine tables of data.) (RS)

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A STUDY OF THE RELATIONSHIP
BETWEEN
BIRTH ORDR AND READING ACHIEVEMENT
AMONG SEVENTH AND EIGHTH GRADERS.

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Adler (1928) concluded that birth order had a determining influence on the social behavior of any human being. He saw the first-born as a "power hungry conservative" and added that children in the extreme positions--meaning first- and last born--had a very heavy burden placed upon their shoulders. The eldest child had to work hard to maintain his position as the first and dominant sibling.

However, Adler was not the first to point to the influence of birth order in society. Toward the end of the last century, Sir Francis Galton (1874) studied the eminent scientists of his time and found that there were more first-born and only children in his sampling population than chance would have allowed.

Following these two pioneers, numerous other researchers had turned toward this topic of birth order that had held ethnic and tribal groups as well as intellectuals in awe for generations and centuries (Fortes, M. 1974). Several variables [psychological, social, educational, economics, success in life, high school attendance, grade point average] among others, had been studied in relation to birth order.

Levinson (1963) studied the total population of third grade pupils of thirteen elementary schools of the ninety-three of a suburban Washington, D.C county and concluded that:

1. The only child when compared with all other positions combined into a 'not-only children' category was a superior reader.
2. In a two-child family, the first-born was a significantly superior reader if bright; however, if he had a below median IQ, he would more likely not be as good a reader as the second born also scoring below the median IQ.
3. In a three-child family, the first-born child, if bright, scored higher on the reading tests than the second born and equally bright sibling. If, however, the first-born child was not bright, then it was the second born of equal intelligence who read better.
4. In a four-child family, the first-born, if he had an above the median IQ, was likely to be a poorer reader when he was compared to the second born sibling, while the first-born with a below the median IQ was a better reader than the second born in this same category.
5. The birth order position of the only child was associated with superior reading ability, even when IQ, S.E.S and sex were held constant.

Otto (1965) grouped his subjects on the basis of five family positions which were: only children, eldest children, first children in a second family, middle children, and youngest children. Second family referred to children who were seven years or more younger than their preceding siblings. Otto found that there were more first and only children among the good readers at the sixth reading level. When the data were analyzed together, there were significantly more only children and first-born children among the good readers. He replicated the study a few months later in the same year and obtained similar results.

Polirstok (1975) found that the Puerto Rican first-born and only children scored significantly higher than the group composed of non Puerto Rican, non-first or non-only

children.

These studies did not try to find out exactly what the nature of the relationship was, nor how that relationship could be applied successfully to the teaching of reading at different grade levels.

On the basis of the above-mentioned studies, it was felt to be appropriate to continue the investigation of the underlying relationships between birth order and reading achievement.

If birth order had a significant relationship with reading achievement, it would help identify a population at risk in the field of reading and appropriate measures could be taken when dealing with children of different birth order positions. As this study dealt with seventh and eighth graders, it should not be taken to mean that reading problems existed only at these grade levels or started at these grade levels. It simply meant that the problems had accumulated since the early grades as reading is a process that is mastered over time, and this process could be influenced by a number of factors including the birth order of the individual. This birth order effect, if it existed, could be taken into account whenever preparation of reading lesson plans is being done. The identification of birth order as a correlate of reading ability/disability would greatly help in the field of the teaching of reading as the more there is information available about the reading

process, the easier it would be to design materials and programs to improve the teaching methodology and techniques.

This study dealt with seventh and eighth grade students. This population was selected because the seventh and eighth grades were the last two grades before the students entered high school. They were also the last two grades --in the American system at least--where reading teachers were available normally to help students improve their reading skills. By the time the students entered high school, they were expected to have developed a level of proficiency in reading that would enable them to tackle such subjects as literature, social studies, history, and others where an extensive amount of independent reading was required.

Methodology

In this study the population was divided into five distinct groups:

1. Those reading above grade level
2. Those reading at grade level
3. Those reading below grade level
4. Those in the learning disabled class
5. Those who had been screened for evaluation but had not been evaluated yet.

These five groups were divided into the following six birth order positions:

1. First-born in families of more than two children
2. First-born in families of two children
3. Second born in two-child families
4. Last born in more than two-child families
5. Middle born--second child in a three-child family, third child in a five-child family, fourth child in a seven-child family, and so on but not second

- or third born in a four-child family.
6. Only child

As measures of reading achievement the scores yielded by the Metropolitan Achievement Tests (MAT) Reading portions were used. Scores on the following subtests were used:

1. Reading Comprehension
 - (i) Critical Analysis
 - (ii) Literal Comprehension
 - (iii) Inferential Comprehension
2. Word meaning
3. Total Reading

The MAT also gives a grade expectancy level for total reading which was used to classify the students as reading at grade level, above grade level, and below grade level.

The population used in this study consisted of all the students of a suburban Philadelphia Senior High School who took the MAT while they were in the seventh and eighth grades. The students of that particular school district are administered the MAT every spring as part of their yearly assessment. This study used the scores of the spring administrations of the students when they were in seventh and eighth grades.

The purpose of this study was to find answers to the following questions:

1. Is there is a birth order effect among the different birth order positions within each grade level group at both the seventh and eighth grade testing on total comprehension, vocabulary, factual comprehension, inferential comprehension, critical analysis, total reading raw and scaled scores?
2. Is there a significant interaction between birth order and reading achievement among the different

birth order groups at both the seventh and eighth grade testing on total comprehension, vocabulary, factual comprehension, inferential comprehension, critical analysis, total reading raw and scaled scores?

3. Is there a significant interaction between sex and birth order and reading?
4. Is there a birth order effect in reading achievement as measured by the vocabulary, total comprehension, and total reading raw and scaled scores when all the birth order groups are put together and the population examined as one unit?
5. Is there a birth order effect to explain the gain or absence of gain in reading achievement between the scores of the seventh and the eighth grades when the seventh grade scores are held constant?

This study used subjects from families where there were no stepchildren.

One way, two way and multiple analyses of variance were used. Whenever significant F ratios were obtained, the Newman Keuls post hoc test was used. The probability level was set at .05.

In all 411 students had been through the seventh and eighth grades in the past three years since that particular school district instituted the compulsory testing system using the Metropolitan Achievement Test (MAT) in both the seventh and the eighth grades. Of these, only 269 were retained for the final study. One hundred and forty-two cases had to be discarded because they did not fit the parameters of this study. They were incomplete because some of the students had missed one or both administrations of the MAT; the students came from families with step-children;

they had recently moved to the area and had missed one of the two administrations; they were not middle-born children as defined for the purpose of this study.

Results

Regarding the first question, it was found that there was no birth order effect among the different positions. The MANOVA was not significant.

Regarding the second question, the ANOVAs revealed that there were no significant differences in the vocabulary, comprehension and total reading raw scores of the different birth order positions. However, when scaled scores were used, there were significant differences in comprehension. The mean and standard deviations for the different groups when comprehension scaled scores were used and the ANOVA results are displayed in Tables 1 and 2.

Table 1

Mean and standard deviations of comprehension scaled scores
for different birth order positions

Seventh Grade				Eighth grade	
Birth order	n	Mean	Std. Dev.	Mean	Std. Dev.
First-born	86	711.38	57.26	711.62	47.37
Not first-born	158	693.98	51.05	700.05	49.67
Only born	25	699.48	54.87	703.40	47.83
Total	269	700.06		704.06	

Table 2

ANOVA table for comprehension scaled scores of the seventh
grade.

Source	D. F.	Sum of Squares	Mean Squares	F
Between	2	16862.50	8431.25	2.95*
Within	266	760072.55	2857.42	
Total	268	776935.05		

The Newman Keuls post hoc test revealed that the first-born were significantly different from the not first-born. The first-born had scored significantly higher than the not first-born. The only children were not significantly different from either the first-born or the not first-born.

When the total reading scaled scores were used no statistically significant differences among the mean of the different birth order positions were noted. Although, there were no statistically significant interactions between birth order and reading achievement, the first-born scored significantly higher than the not first-born when comprehension scaled scores of the seventh grades were used in the computation of the ANOVA.

Regarding the third question, the analyses of variance revealed that there were no statistically significant differences between the mean of first-born females and not first-born males when vocabulary, comprehension and total reading raw scores were used. However, when the comprehension scaled scores were used, the analysis of variance revealed that there existed a significant difference. The mean and standard deviations for the comprehension scaled scores of the two groups and the ANOVA results can be seen in Tables 3 and 4.

Table 3

Mean and standard deviations of comprehension scaled scores
of the two groups

Source	n	Mean	Std. Dev.
First-born females	53	714.43	6.34
Not first-born males	81	699.88	5.98
Total	134	705.63	

Table 4

ANOVA table for comprehension scaled scores

Source	D.F	Sum of Sq.	Mean Sq.	F	Prob
Between	1	13803.44	13803.44	4.91	.03
Within	132	371110.56	2811.44		
Total	133	384914.00			

The Newman Keuls post hoc test showed that first- born females performed significantly better when comprehension scaled scores were used for the analysis. The ANOVAs also showed that there existed a significant difference between the two groups when the total reading scaled scores were used. The mean and standard deviations of the two groups and the ANOVA results are displayed in Tables 5 and 6.

Table 5

Mean and standard deviations of total reading scaled scores of the two groups

Birth order		Mean	Std. Dev.

First-born	53	712.89	55.66
females			
Not first-	81	693.33	49.15
born males			
Total	134	701.06	

Table 6

ANOVA table for first-born females and not first-born males
on total reading scaled scores.

Source	D.F.	Sum of Squares	Mean Squares	F	Prob.

Between	1	12249.07	12249.07	4.5	.03
Within	132	354393.32	2684.80		
Total	133	366642.39			

The Newman Keuls post hoc test revealed that first-born females had obtained higher total reading scaled scores than not first-born males.

A series of two way ANOVAs were also performed with vocabulary, comprehension, and total reading scores as dependent variables and birth order positions, as defined for the purpose of this study, and sex as independent variables.

No birth order/sex interactions were noticed when the ANOVAs were performed. However, although there were no birth order/sex interactions, first-born females were significantly better when the comprehension and total reading scaled scores were used in the analysis. Otherwise when the raw scores were used, no significant differences were noticed.

Regarding the fourth question, multiple analyses of variance were performed. First, the vocabulary, comprehension, and total reading raw scores for the seventh grade were used as dependent variables with the six different birth order positions as independent variables. Wilks test was performed and it yielded an F value of 1.15 with a significance of .31.

The scaled scores were next used in the analysis and this time, the Wilks test yielded an F value of 1.68 with a significance of .05. Consequently one way analyses of variance were performed to find where the significant difference was. The ANOVAs produced significant F ratios in all three cases. The ANOVA results for vocabulary, comprehension, and total reading scaled scores are displayed in

Tables 7 through 9.

Table 7

ANOVA results for vocabulary scaled scores for seventh grades for the six birth order groups.

Source	D.F.	Sum of Sq.	Mean Sq.	F	Prob.
Between	5	23200.85	4640.17	2.34	.04
Within	263	522662.01	1987.31		
Total	269	545862.86			

The Newman-Keuls post hoc test showed that the first out of two children were significantly different from the last children of families of more than two children in that they had significantly better vocabulary scaled scores than the last children of families of more than two children.

Table 8

ANOVA results for comprehension scaled scores for the different groups.

Source	D.F.	Sum of Squares	Mean Squares	F	Prob
Between	5	32979.02	6595.80	2.3	.04
Within	263	743956.03	2828.73		
Total	269	776935.05			

The Newman-Keuls post hoc test showed that the first-born in families of two children had significantly different comprehension scaled scores than the last born of families of more than two children. They scored significantly higher.

Table 9

ANOVA results for the seventh grade total reading scaled scores for the different birth order positions.

Source	D.F.	Sum of Squares	Mean Squares	F	Prob.
Between	5	32034.86	6406.97	2.41	.04
Within	263	697356.14	2651.54		
Total	268	729391			

The Newman-Keuls post hoc test showed that the first-born of families of two children were significantly different from the last born of families of more than two children. The first-born of families of two children were significantly better readers than the last born of families of more than two children when scaled scores were used.

When the eighth grade raw scores were used, the Wilks test yielded an F value of 1.23 with a significance of .24.

Next the eighth grade scaled scores were used in the computation. The Wilks test yielded an F value of 1.07 with a significance of .38.

The multiple analysis of variance showed that when the seventh grade scaled scores were used for the analysis, there was a significant birth order effect in that the first-born of families of two children were significantly better than last born of families of more than two children in vocabulary, comprehension, and total reading.

Regarding the fifth and last question, two sets of analyses of covariance with the raw and scaled scores were performed. In both cases, the F ratios were not significant. Consequently, on the basis of these results birth order could not explain the difference or absence of difference between scores of seventh and eighth grades.

Conclusion

Through the results of this study, it seemed obvious that there was a discrepancy between scaled and raw scores. It would appear that scaled scores were not reflecting the raw scores in a genuine way. If they were doing so, the different statistical analyses performed while using raw scores would have produced significant results too. This should serve as a warning to users of scaled scores. Although scaled scores are important to compare a student's performance on different forms of the same test, care should be taken when using raw and scaled scores of the same form of the test. It would appear that scaled scores inflate the raw scores by making the differences larger in number. It would be highly recommended to pay attention also to the raw

score, and not to rely solely on the scaled score.

However, one should not discard the findings reached by this study when scaled scores were used, namely:

1. that first born children performed significantly better than not first born
2. that first born females performed significantly better than not first born males
3. that first born in two-children families performed significantly better than last born of families of more than two children.

Implications for teaching

Despite these findings, the implications of these results for teaching are that in the regular classrooms, there is as yet no need to group children by birth order because there is no significant difference in the reading achievement of children of different birth orders when raw scores are used. Teachers should not let birth order be a factor that could affect their judgment of a child.

Teachers could also help dispel the bias that many parents and some teachers may have concerning the higher achievement potential of first-born over last born children until future studies show that there is a significant difference when raw scores are used. Should a parent express his/her concern, that his/her last born is not reading as well as his/her first or second born, to the teacher, the latter should inform the parent that in the

field of reading, it has not yet been shown that birth order has a statistically significant effect. The birth order effect in the field of reading has not been made clear yet.

Implications for further research

This study has analyzed different birth order positions on a seventh and eighth grade population and has found no significant results when raw scores are used. Future studies might use additional variables while analyzing scores of reading achievement tests. Future studies could use variables such as self-concept, socio-economic-status and IQ together with the reading subtest scores.

It would also be interesting to have a longitudinal study over the whole elementary school years or high school years to investigate the effects of birth order. However, the limitations of such a study may be that the birth order can be changed during the course of the study, which fact may cause the researcher to modify his design very often. However, the researcher could look into the archives of a whole elementary school population and isolate cases where the birth order did not change at all during the whole period of elementary school. The same criteria used for the present study could be retained, that is, the same birth order positions and the same reading scores could be used. The only problem that could present itself for such a study might be the difficulty of finding a school that had administered reading tests to its elementary school

population on a yearly basis.

Another study could stretch the range of the population to the end of the middle school period. Finally, a last study could cover the whole range of first grade to high school. If it is not possible to find schools that have administered the same reading tests throughout, results from different reading tests could be used. In such cases, it would be highly recommended to use grade or age expectancies instead of the scores proper. The rationale is that different tests have different ways of computing scaled scores; different tests have different numbers of items; but when it comes to grade or age expectancies, all tests use the same criteria, that is grades are given in ten-month years, and age is given in twelve-month years.

This study did not obtain significant results because only two main variables (they were the only ones given by the MAT) were used. Harris and Sipay (1990) mention a wide range of reading areas that can be assessed. Therefore future studies should try to use scores of different reading subtests such as word recognition, oral reading, sight vocabulary among others.

The MAT is a paper and pencil standardized achievement test that does not control for guessing. Consequently, the scores could be inflated because many students could obtain correct answers by guessing and not even reading the paragraphs. It is therefore recommended that future studies

also use scores from informal reading inventories. However, care should be taken to make sure that there is a very high inter-scorer reliability if more than one person is going to administer the tests.

Some affective variables could also be introduced. A future study could add the readers' attitude to reading, the families' view of reading, and the readers' self perception as readers.

Finally, a study could be done on the discrepancy between raw scores and scaled scores in general, not only in the field of reading. Such a study, although it will not have to be done in the context of birth order research, should prove very valuable to statisticians and educational psychologists involved in testing and measurement.

Although this present study has failed to demonstrate a definite relationship between birth order and reading achievement, it has shown that birth order study should not be wholly discarded because some significant results were produced.

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